



A traveling bridge spans the concrete rearing ponds at Niagara Springs Steelhead Hatchery. Hatchery buildings, feed storage silos and the springs rising below lava cliffs are also visible.

## ENGINEERS CONTRIBUTE TO IMPROVEMENT OF IDAHO'S STEELHEAD TROUT FISHING

By D. E. ANDERSON, P. E.

Countless hours of stream sport for outdoorsmen are expected to result from the new fish facility shown here in a scenic setting on the Snake River in Idaho's Hagerman Valley. It is the Niagara Springs Steelhead Hatchery, built by the Idaho Power Company under its responsible and cooperative program of migrant fish conservation.

Now completed and in full operation by the Idaho Fish and Game Department, it is the biggest steelhead hatchery in the nation. This is the key facility in an attempt to transplant steelhead runs from the Snake River to spawning areas in the Salmon River drainage.

Fingerlings produced by adult steelhead taken from the Snake River at Hells Canyon will be fed for some 10 months in the hatchery's 14 concrete raceways, each 300 feet long. Feeding is performed automatically by a moving bridge extending across the raceways, which are capable of rearing a minimum 1.6 million steelhead and are supplied with water from the nearby springs.

As they near the migrating stage, the fish will be transported several hundred miles in tank trucks to holding ponds on a Salmon River tributary. From here they will move downstream to the Pacific Ocean as part of their four-year cycle of migration that will see them return as adults to provide what is ex-

pected to be a substantial new sports fishery in a new location.

The Niagara Springs complex was completed in mid-1966 and has an interesting background, particularly in regard to the planning and engineering design stages. Mr. H. R. Moore, Professional Engineer and Idaho Power Executive, was the prime mover in this project from the start of planning to final completion of the facility.

Wendell Smith, Idaho Power Company Fish Biologist, supplied the technical "know how" required to coordinate the biological aspects related to steelhead trout rearing with the mechanical and physical components of the facility.

The Consulting Engineering firm of Barton, Stoddard, Milhollin & Lupton, Inc. of Boise, Idaho, was retained to accomplish the engineering design of the facility, and the MacGregor Triangle Company of Boise was the constructor.

From the outset, Mr. Moore insisted upon almost complete mechanization of all facilities related to the care of the fish to be reared at Niagara Springs. Prior to this time most fish rearing facilities of a similar nature have incorporated manual or "semi-mechanized" methods of feeding, fish handling and pond maintenance.

At Niagara Springs every effort was directed toward elimination of manual labor both for reasons of operational economy and overall efficiency designed to rear steelhead trout with a minimum of losses.

Perhaps the most unique feature of the rearing ponds facility is related to the physical configuration of the ponds themselves. Where conventionally ponds are constructed with separating roadways or walkways to allow access alongside ponds for feeding or other facets of fish culture, the Niagara Springs ponds are all placed in contiguous locations, (i.e., ponds are separated only by 8" concrete walls which allows no vehicular and only limited "on foot" access).

This consolidation of overall pond area is important for the application of the "total automation" concept utilized.

In order to provide access to all areas of these rearing ponds; the "traveling bridge" was designed. This bridge spans the overall 150 ft. of pond width, is 12 ft. wide, with a deck which will allow a conventional small vehicle such as a pickup truck to traverse its entire length and enter or exit from either side.

Steel rails were installed longitudinally on top of alternate pond walls with

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a resultant rail spacing of 20 feet. The bridge travels on these rails by means of double flanged iron wheels.

Power is supplied by means of a cable and automatic take-up reel for all purposes, including the main bridge drive. The drive motor is a DC unit supplied from the 240-volt AC supply by a three-phase silicon controlled rectifier, and which provides adjustable regulated speed in either direction, controlled acceleration, and dynamic braking.

Since the bridge is exceptionally long with respect to its width and moves at right angles to the long dimension, both mechanical and structural problems presented themselves to make provision to take care of expansion and contraction and to prevent structural deformation. The trucks were equipped with a system of sliding and fixed collars and spacers to compensate for the expansion-contraction problem, and also to maintain alignment.

Although at times during the design stage even the design engineers expressed some apprehension as to the workability of such an ungainly traveling structure, Dick Moore steadfastly refused to look back. When, after final assembly and "shakedown," the installation performed almost flawlessly and his confidence was vindicated.

The completed bridge mounts 14 automatic fish food feeders (one for each pound). Food is stored in two metal silos from which it is mechanically transferred to the bridge mounted feeders by means of a drag-type conveyor.

The actual feeding of the steelhead fingerlings is carried out as follows:

With the feeders loaded with a pellet type fish food, the bridge traverses the length of the ponds at speeds variable from 0 to 100 ft./min. and the feed is spread over the water surfaces of the ponds at a uniform and controlled rate. Thus two and a half million fish can be fed in a matter of five minutes time.

Another function which will be carried out from the bridge deck is the fish grading. For this activity, the fish are actually sorted according to size and segregated to allow more uniform feeding and prevent cannibalism. A fish pump and fish grades have been supplied for this purpose.

The fish pump is patterned after "Morton's Monster," otherwise termed a "piscatorial combine;" and developed by Mr. Gene Morton, Wizard Falls Fish Hatchery, Camp Sherman, Oregon. The fish are introduced by suction into a tank containing a screen-basket which slides up and down inside the tank. When tank is filled with fish and water, the flow is reversed and fish and water forced out into a flexible hose for delivery to grader, pond or tanker truck.

An added feature of the Niagara Springs facility is the water cooling installation provided for "tempering" fish prior to transporting. An ice cabinet capable of cooling water in substantial quantities to temperatures near freezing has been installed for this "tempering" procedure which is expected to effectively increase the quantity of fish measured by weight that can be transported per given volume of water.

By gradual reduction of water temperatures, the fish become semi-dormant, give off less nitrogenous waste and can be transported with a lower mortality rate and in greater numbers than if they were transported in water of more normal temperature range.

It should be here pointed out that the prime reason for selection of Niagara Springs as the site for this steelhead trout hatchery and rearing facility is

that the water supply from these springs maintains a constant 58° temperature which is ideal for the rapid rearing of this species.

In addition, the Niagara Springs complex incorporates a modern hatchery facility, where the steelhead eggs will be hatched and the newly hatched "fry" cared for prior to placement in the outdoor rearing ponds. Three newly constructed residences for State Fish and Game Department personnel who man the facility, and a complete landscaping program which is eventually designed to make Niagara Springs a truly picturesque setting for perpetuating Idaho's steelhead runs, are also included.

As mentioned earlier, the fish reared to the migratory age at Niagara Springs will be transported to release ponds on a Salmon River tributary and from there they will begin their long journey to the Pacific Ocean.

At the termination of the return cycle from ocean to a Salmon River tributary, returning adult steelhead trout will be trapped and eggs taken for hatching to start a new cycle designed to perpetuate the species for the benefit of those sport fishermen who will cast their lines into Salmon River waters in future years.

This question now comes to mind: "Will the beautiful adult steelhead trout returning to a Salmon River tributary on their return cycle from the ocean raise their heads above the water's surface and hopefully search for the tanker truck to return them overland to the restful, healthful waters of Niagara Springs, from whence the long journey began?"

While the names Pahsimeroi, Lemhi, Marsh Creek and Rapid River (all Salmon tributaries) may have little meaning for the salmon and steelhead fisherman of today, hopefully these will be the places that the "Isaac Waltons" of the coming decades will never forget.



"Traveling Bridge" with pickup truck and fish grader on deck.